NOTE.—*The application for a Patent has become void.*

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PATENT SPECIFICATION

393,243

Convention Date (Holland): Nov. 26, 1930.

Application Date (in United Kingdom): Aug. 24, 1931. No. 23807/31.

Complete not Accepted.

COMPLETE SPECIFICATION.

Improvements in Friction Wrenches.

We, LOUWERENS JOHANNES NOOMEN and ROBERT TIJKEN, of Bilderdijklaan 81, Rijswijk, Province of South-Holland, Netherlands, both subjects of the Queen of Holland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to an apparatus which can be used to impart to a body, which can exert any desired action, an intermittent rotation which if necessary may be reversed.

Single and double acting wrenches and jacks are known which work with ratchet teeth, rollers, balls, and the like. In general, however, one or more of the following disadvantages attach to these tools, namely:

a) Too much free play.

b) The part of the tool which drives the rotating part cannot be introduced into a small space.

c) The great danger of interruptions in working in consequence of the fact that comparatively light parts play an important role in the action.

d) Too complicated a construction.

The invention offers an improvement with respect to the above disadvantages, and opens up a greater field of use. By means of the invention, it is possible to use;

1) a sub-divided or multiple part rotating body which permits clamping of the work or the tool, the latter becoming more securely clamped corresponding to the increase of load.

2) a rotating member with ball shaped frictional surface, in consequence of which it is possible to vary the angle between the lever and the axis of rotation within certain limits, the clamping action not, however, being influenced.

The invention is more fully explained with reference to examples shown in Figures 1 to 12 of the accompanying drawings.

[*Price* 1/-]

In the six different embodiments, corresponding parts are indicated by similar reference characters, the body to which an interrupted rotation is to be imparted being indicated by *a*.

b is the clamping device with clamping members *b*2, *b*3 and tailpieces *b*4;

c is the lever on which the driving force is applied;

d are pins, cams, or similar transmission members between the lever and the clamping member;

e are the stops;

f are springs which in the embodiment according to Figures 1 and 2, 5 and 6, 7 and 8, and 9 and 10 are there used;

g is an adjusting device for the stop *e* used in the embodiment according to Figures 3—4, 7—8, 11—12.

The apparatus can be made to work on one or both sides, that to be first described being of the latter type.

Since the lever *c* is rotated in one or other direction of rotation, the clamping members *b*2 and *b*3 of the clamping device *b* are so moved towards each other by the parts *d* that the body *a* is firmly clamped, and is carried round upon further rotation of the lever *c*. On reversing the direction of rotation of the lever *c*, the clamping device loosens, and on continued rotation in the reversed direction the body *a* would be again clamped and carried round if the lever were not held fast by the stop *e* before the clamping position of the lever is reached. This stop now carries round the loosened clamping device on the return stroke.

The body *a* may have different forms according to the purpose for which it is required; but the contact surface, that is, the friction surface, must be that of a rotatable body (cylindrical, spherical or conical surface etc.). This body may be formed by any tool (fixed spanner, adjustable spanner, screwdriver, boring tool, interchangeable holder or nut spanner or any desired part of any device (starting or driving device of machine tools, lifting

tackle, and the like). Should the body *a* be made as a grip or handle, it may be made in one piece or sub-divided into a number of parts, so that the corresponding tool or machine part may be clamped. The friction surface of the body *a* is preferably made spherical in cases where it is desired that the axis of the clamping device should be inclined to the axis of rotation. In all simple cases, on the contrary, where this requirement is not implied and in those cases in which the possibility of movement of the clamping member along the axis of rotation is desirable, the frictional surface may be made cylindrical. The friction surface is made as a single or multiple conical surface according to the frictional co-efficient of the material used, that is, according to the permissible tension and compression stresses in the transmission members of the clamping device. The construction may also be so carried out that with the use of a number of cone surfaces or parts of spherical surfaces, any play between the body *a* and the clamping device *b* is adjustable by mutual adjustment.

The clamping device *b* consists of one or more clamping bands or clamping blocks, which can form a unit and be connected with one or more tailpieces *b*4. The friction surface of the clamping device fits against the friction surface of the body *a* and has essentially the same profile, although in particular cases different profiles may be used (simplification in production and easier interchangeability of the separate parts, etc.).

The tailpieces have for their object to transmit the compression and tensile forces on to the friction members, and are for this purpose provided with the necessary recesses, pressure surfaces, bearings, and the like. They serve at the same time as supporting surfaces for the stops. In view of the shape of the lever *c*, which can be as desired, the pins *d* may be made in different ways. The compression and tensional forces can be taken by separate parts, or by a combined part. Since these parts can be made adjustable, it is possible to compensate for the play produced by wear. By means of cams acting on the tailpieces and which prevent clamping by the lever *c* in one or the other, or even in both directions of rotation, or permits it in both directions of rotation, the apparatus can work in four different ways, namely,

1) clamping in both directions of rotation;

2) clamping in only one direction with free return stroke;

3) clamping in the opposite direction of rotation, free return stroke,

4) entirely free running in both directions of rotation.

It is possible to effect two or more of these actions by means of a single part.

Since these cams are made adjustable, it is possible to compensate for any play.

Preferably, the cams bear in the active position under spring action against the tailpieces, and the spring provided for this purpose will have a tendency to take up any play produced between cam and bearing surface, consequently the loose play is always restricted to a minimum. During the backward stroke, the clamping device is only so far loosened that the friction with the rotatable body *a* is equal to the tension of the spring *f*. Since the tension of this spring is varied, the loose play and also the friction during the back stroke are correspondingly influenced.

Figures 1 to 8 show four different embodiments of double acting friction wrenches. In the embodiment according to Figures 1 and 2, the forces of the couple produced on the movement of the lever *c* are converted by the lever action of the tailpieces in the correct proportion into a compression force on the clamping limbs *b*3, and tensional force on the clamping band *b*2, for which purpose the clamping band and the tailpiece are resiliently connected together. The stop is here formed by a movable ratchet lever which may assume three different positions. In the centre position, this lever is ineffective, and the part *a* to be driven is then clamped in both directions of rotation and carried round. Any play is taken up by the springs *f*. In the embodiment according to Figures 3 and 4, the action is the same as in Figures 1 and 2, with the difference, however, that the combined pressure and tailpiece is not divided by a plane through the axis of rotation, but by a plane perpendicular to the axis of rotation. The ratchet lever is here also made as a rotatable lever which can assume three different positions; the play can be separately adjusted by a screw for the two directions of rotation.

Figures 5 and 6 show an embodiment in which the tailpiece and the pressure piece are arranged loosely with respect to each other, one force of the couple obtained, which is produced upon movement of the lever *c*, causing the application of the clamping shoe or jaw directly by means of a pin and the second force being distributed by means of the other pin by the yoke of the tailpiece, in correct proportions over the ends of the clamping band as the tensional force.

The ratchet lever is here replaced by a movable cam, while any play is taken up by the spring *f*.

A simpler embodiment which, however, is based on the same principle, is shown in Figures 7 and 8. The lever *c* and the clamping member *b3* here form one unit; the same holds good for the pins *d*, while the stop *e* made as a part of the rotatable lever *c*, which is held fast by means of an adjustable cam, bears by means of the spring *f* against the tailpiece 4.

If the stop *e* of any double acting friction wrench made according to the invention is not constructed so as to be adjustable but is connected firmly with the lever in its working position, there is produced a single-sided acting friction wrench. The advantages of the various embodiments which are attained by the construction of a double-sided acting wrench, are also obtained in the single-sided form of construction, with the exception, however, of the reversability of the action; a simplification of the construction is thereby obtained.

Figures 9 to 12 show two different embodiments of a single-sided acting wrench. In the construction according to Figures 9 to 10, one of the forces of the couple produced by the rotation of the lever *c* is, in consequence of the lever action of the tailpiece, split up in correct proportion into a pressure force at the points *b3* and a tensional force at the ends of the clamping band *b2*; for this purpose, the clamping band and the tailpiece are hinged together, while the other force of the couple produces the necessary tensional force directly at the other end of the clamping band. The return stroke is regulated by the fixed cam *e*. Any free play is taken up by the spring *f*. Figures 11 and 12 show a simplified construction of the device shown in Figures 9 and 10, the same principle, however, being used and the essential parts which are also in Figures 9 and 10 being also found therein.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A friction wrench consisting of a clamping member, a part which is to be rotated co-operating therewith, and a lever by means of which the clamping member can be clamped in one or other direction of rotation, characterised in that the friction surface of the part to be rotated is of spherical shape.

2. A friction wrench consisting of a clamping member, a part which is to be rotated co-operating therewith, and a lever by means of which the clamping member in one or other direction of rotation, characterised in that the friction surface of the part to be rotated is of conical shape.

3. A friction wrench consisting of a clamping member, a part which is to be rotated co-operating therewith, and a lever by means of which the clamping member is firmly clamped in one or other direction of rotation, characterised in that the clamping member is so arranged and such means exist that it is firmly clamped in the two opposite directions of rotation against the body to be rotated, while the clamping by the above-mentioned means can, as desired, be prevented in one or other or in both directions of rotation.

4. A friction wrench according to claim 3, characterised in that clamping of the body to be rotated is prevented by an adjustable stop or ratchet lever.

5. A friction wrench according to claim 4, characterised in that the ratchet lever or the stop acts by means of a spring on the clamping member.

6. A friction wrench according to claim 3, characterised in that the friction surface of the part to be rotated forms a spherical surface.

7. A friction wrench according to claim 3, characterised in that the friction surface of the part to be rotated is a conical surface.

8. The improved friction wrench substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 24th day of August, 1931.
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Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1933.

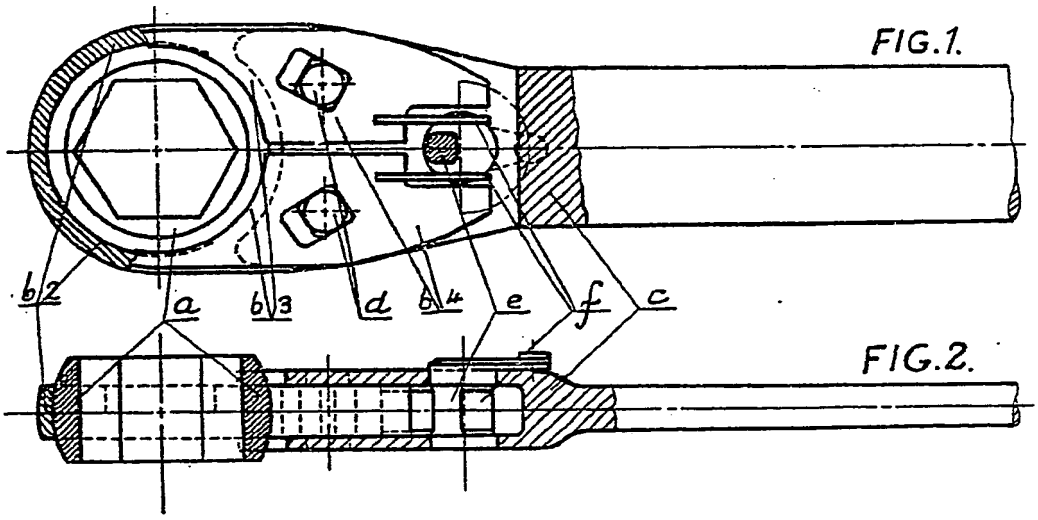

FIG.1.

FIG.2.

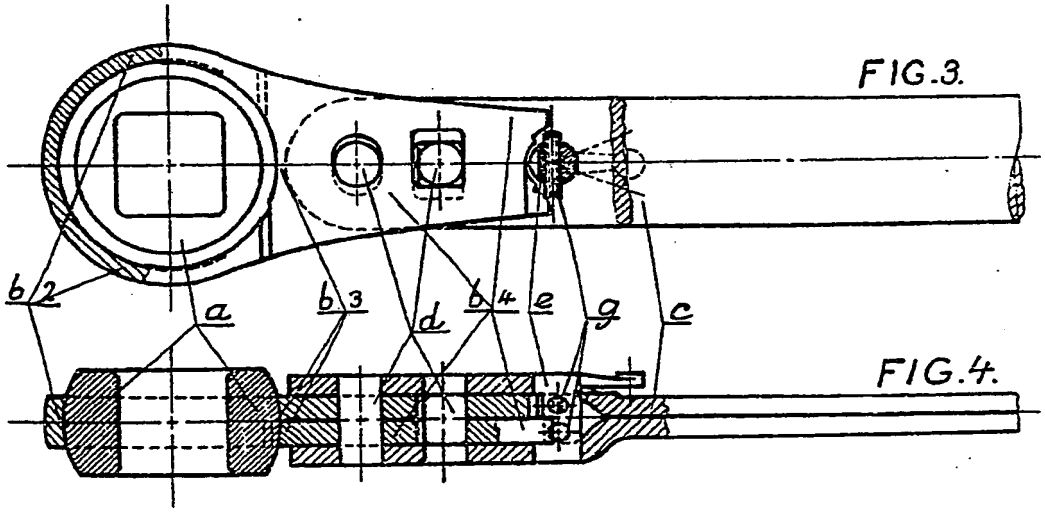

FIG.3.

FIG.4.

FIG.5.

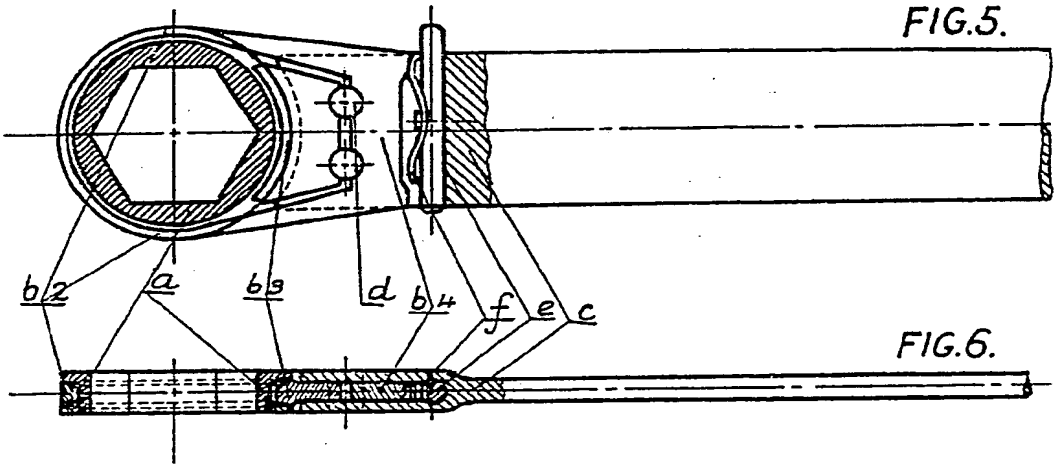

FIG.6.

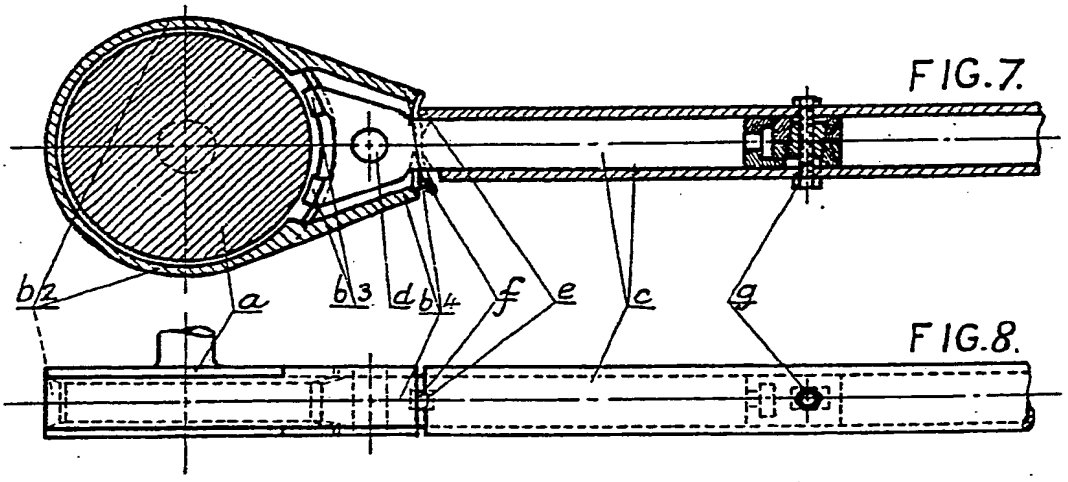

FIG.7.

FIG.8.

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FIG.1.

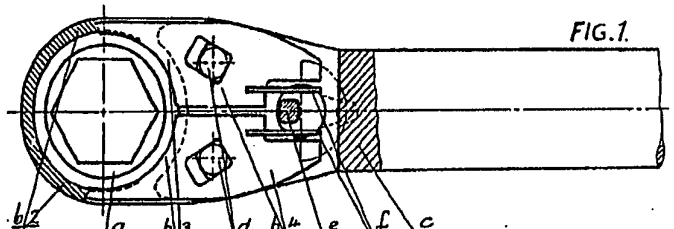


FIG.2.

FIG.3.

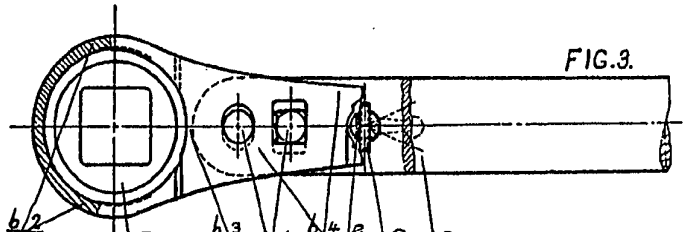


FIG.4.

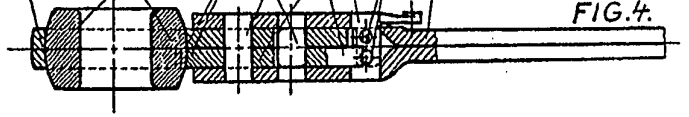


FIG.5.

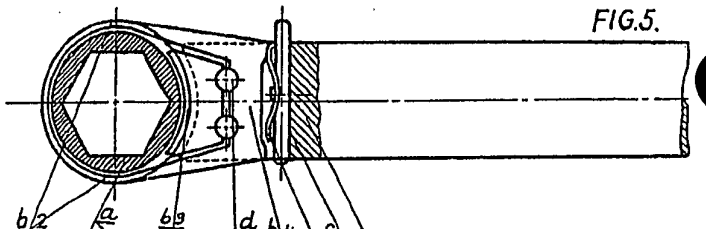


FIG.6.

FIG.7.

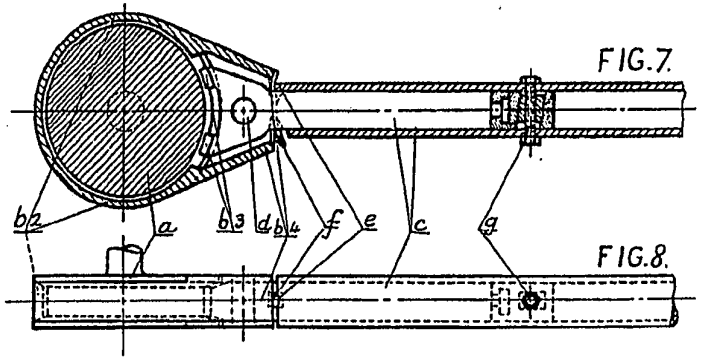


FIG.8.

FIG. 9.

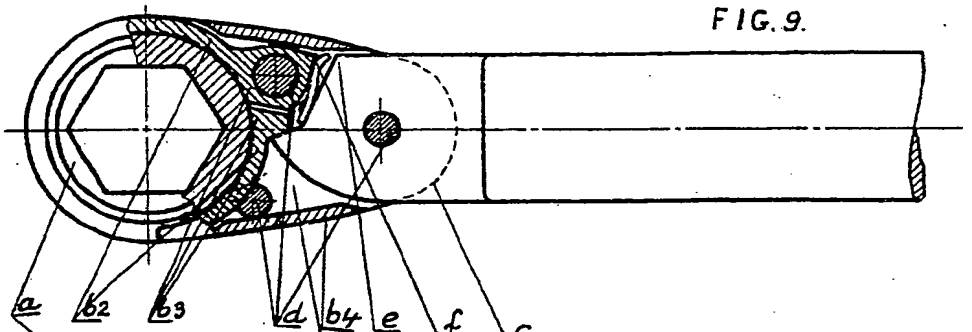


FIG. 10.

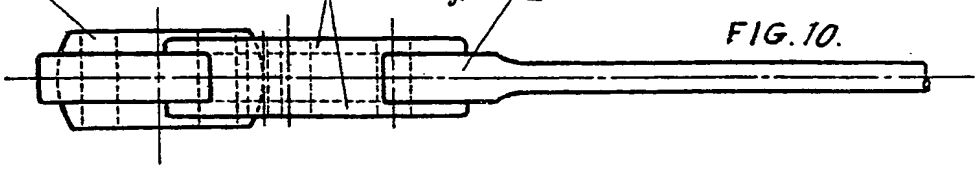


FIG. 11.

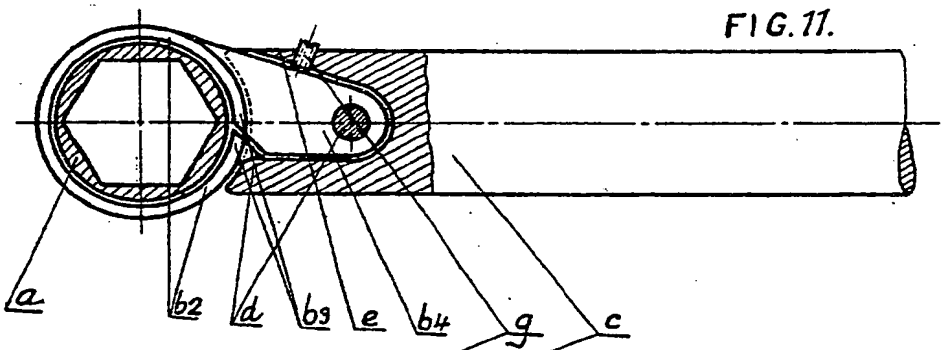
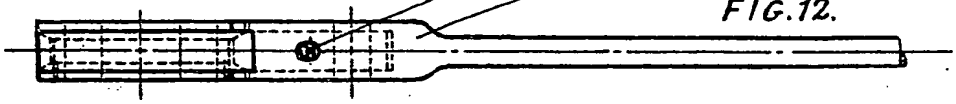


FIG. 12.



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